

PORTLAND FIRE WEATHER – 2004 ANNUAL REPORT

CRITICAL FIRE WEATHER EVENTS

“Critical Fire Weather” conditions are those that **COULD** result in extreme fire behavior, or, in the case of problem or “dry” lightning, an abnormally high number of ignitions. One must be careful when assessing problem or “dry” lightning. There are times when lightning activity does not meet Red Flag criteria (at least LAL 3 coverage), but does result in a high incidence of project fires.

The overall severity of any fire season is highly correlated with the extent and frequency of critical fire weather patterns during the season. It is not unusual to have an extended “dry period” during any given fire season. This in itself could result in an elevated degree of fire activity, provided the fuel conditions are right. However, to elevate a high fire danger situation to a critical or extreme level normally requires an additional weather element (trigger event) to be superimposed on the dryness. This additional “trigger” could be problem or “dry” lightning, an extremely unstable air mass, or a combination of strong wind and low humidity. Red Flag Warnings are issued when a combination of critical weather exists **WITH** sufficiently dry fuels and severe burning conditions. The Red Flag criteria for the Portland Fire Weather district are listed below.

CRITERIA FOR STRONG WIND AND LOW HUMIDITY (NIGHT)

ZONES 601 AND 602: Two stations must report 35% humidity or less **AND** 10-minute wind speed of 10 mph or more for 3 hours in an 8-hour block.

ZONES 603 AND 612: Rockhouse1 RAWs must report 35% humidity or less **AND** 10-minute wind speed of 15 mph or more for 4 hours in an 8-hour block **AND** one other RAWs must report 35% or less humidity **AND** 10-minute wind speed of 10 mph or more for 2 hours.

ZONE 604: Two stations (airports) must report 30% humidity or less **AND** 2-minute wind speed of 15 mph or more for at least 4 hours in an 8-hour block.

ZONES 605, 607, AND 660: One station must report 35% humidity or less **AND** 10-minute wind speed of 10 mph or more for 4 hours in an 8-hour block **AND** at least **TWO** other stations must report 35% or less humidity **AND** 10-minute wind speed of 10 mph or more for at least 2 hours.

ZONES 606 AND 608: One station must report 30% humidity or less **AND** 10-minute wind speed of 10 mph or more for at least 4 hours in an 8-hour block **AND** one other station must report the same for at least 1 hour.

CRITERIA FOR STRONG WIND AND LOW HUMIDITY (DAY)

At least 2 stations within a zone must report 25% humidity or less **AND** wind speed of 10 mph or more (except 15 mph in zone 604) for at least 4 hours in an 8-hour block.

CRITERIA FOR DRY AND UNSTABLE AIR MASS (HAINES 6)

At least **ONE** station within a zone must report 25% humidity or less **AND** show a high-level Haines value of 6 **AND** fuel conditions (Dryness Levels) are in the “RED”. At forecaster discretion, can also be issued when Dryness Levels are “YELLOW”.

EPISODE (PROBLEM) LIGHTNING

Dryness Levels **MUST** be in the “RED” and expected lightning frequency is such that multiple starts (about 5-7) are expected. Typically scattered or LAL 3 coverage. At forecaster discretion, can also be issued when Dryness Levels are “YELLOW”.

PORTLAND FIRE WEATHER – 2004 ANNUAL REPORT

There were four critical fire weather events during the 2004 fire season. All events resulted in Red Flag Warnings. There were no missed events. All four events were for “problem” or “episode” lightning. Surprisingly, there was not one wind/low humidity event, nor was there an unstable air mass day.

1. AUGUST 1, 2004

This was the first lightning event. A look at the area summaries showed that the end of July was one of the warmest periods of the season. Several RAWS sites in the Coast Range, Cascades, and Cascade foothills observed high temperatures in the middle 80s to lower 90s from July 28th through the 31st. Afternoon humidity values ranged from 25 to 40 percent. On July 30, a four-corners upper level high pressure was the dominant feature (see figure 5 below). Note that there was a little upper level low sitting off the south Oregon Coast. This would become more of a player during the next 24 to 48 hours.

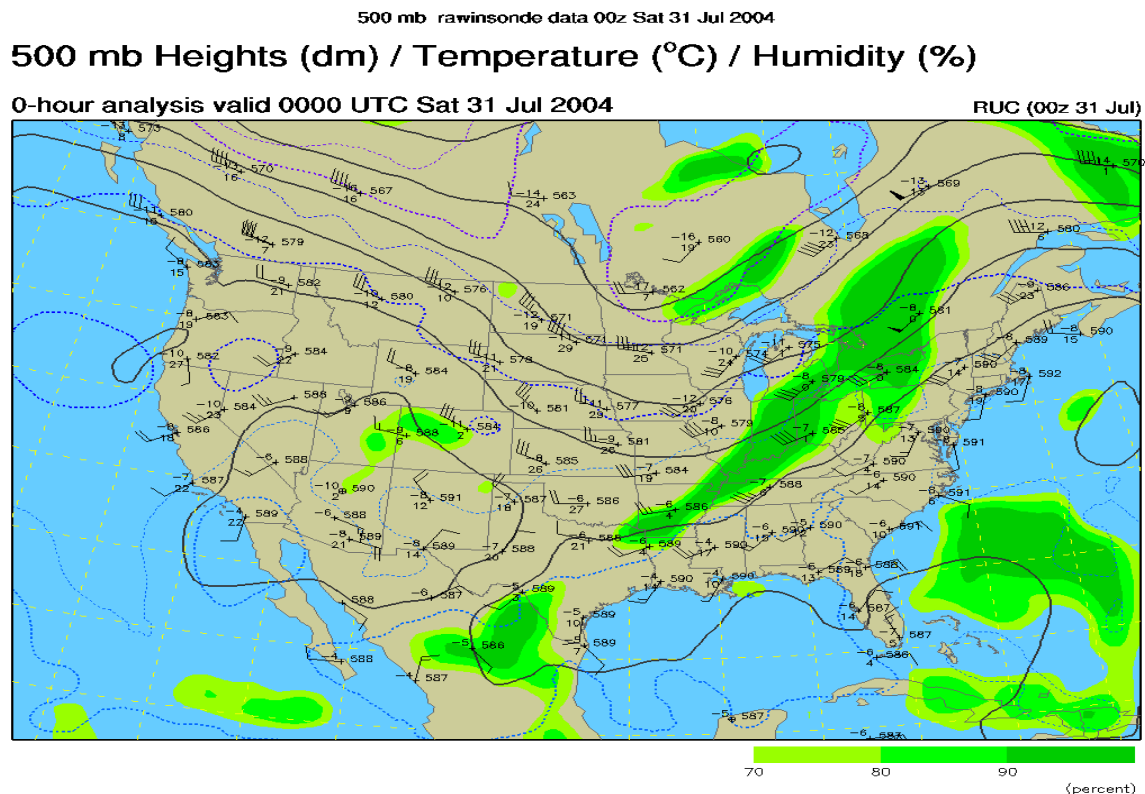


FIGURE 5

The pattern changed on the 31st. The four-corners high was still quite prominent. However, the upper low off the south Oregon Coast had become more established. This low resulted in a good influx of moisture into the area (see figure 6). A Fire Weather Watch was issued at 1247 PDT on the 30th for zones 606 and 608, valid on August 1st. Critical fuel conditions existed at the time. The Northwest Coordination Center’s Dryness Level product showed the Central Cascades and foothills in the “RED”. ERC

PORTLAND FIRE WEATHER – 2004 ANNUAL REPORT

values were mainly in the 50s to lower 60s. Emigrant RAWS observed an ERC of 67 on the 29th, and 65 on the 30th. The area average was 50-55.

500 mb rawinsonde data 00z Sun 01 Aug 2004

500 mb Heights (dm) / Temperature (°C) / Humidity (%)

0-hour analysis valid 0000 UTC Sun 01 Aug 2004

RUC (00z 01 Aug)

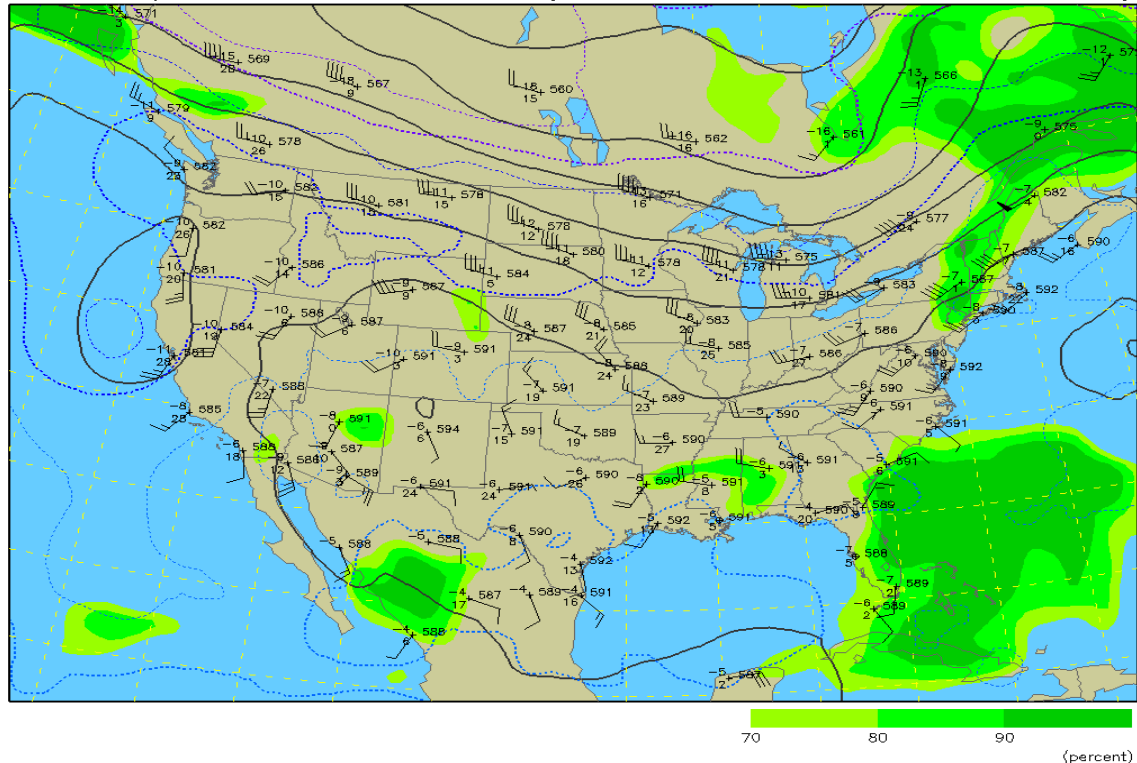


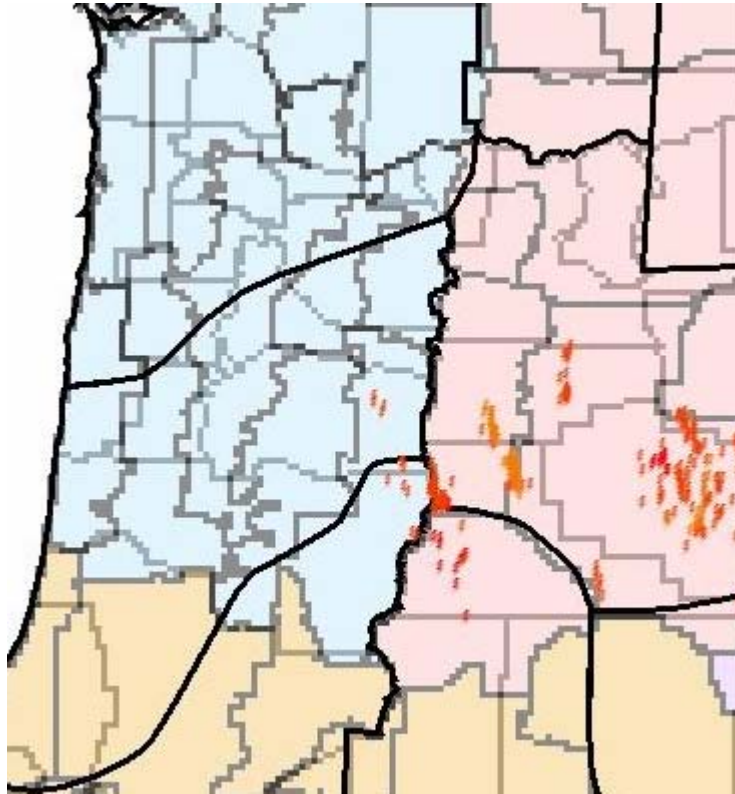
FIGURE 6

The closed upper low converted to an open upper trough by 12Z on August 1st. Southeast to South flow of 25 knots prevailed over Western Oregon (based on the upper soundings at Medford and Salem). The Watch was updated at 823 am PDT on August 1 to drop the north part of zone 608. However, the watch was upgraded to a Red Flag warning at 829 am and was valid through 2200 PDT. The warning was valid for just the south part of zone 608. The 700 mb chart valid 00Z on August 2nd showed a moist band (humidity above 70 percent) extending from the south end of zone 612 to the Central Cascades. This would seem to imply potential wet thunderstorm activity. However, due to the change in Red Flag philosophy, the issue was not whether the warned area would receive “wet” or “dry” lightning. The real issue was the state of the fuels during and after the event. ERC values on the 1st, for zones 606 and 608, remained in the middle 40s to middle 50s, with Emigrant at 65. Critical values for this area are around 50. ERC values on the 2nd were still in the 40s to middle 50s.

The Red Flag Warning was updated at 1643 PDT to include all of zone 608 and also zone 607. The warning was valid until 2300 PDT. Lightning was detected between 1800 and

PORTLAND FIRE WEATHER – 2004 ANNUAL REPORT

1900 PDT on the 1st. However, the lightning occurred in the north part of zone 608 (see figure 7). The warning was ended at 2056 PDT. There were 4-5 fire starts, according to the Eugene Interagency Dispatch Center, fuels were in the “RED” before the event, and remained in the “RED” after the event. Emigrant and Pebble RAWS recorded 0.25 inches or more of precipitation. Certainly, based on the old criteria, this case would have been classified as a “wet” lightning episode.



***FIGURE 7 – LIGHTNING 0600 TO 0600 AUGUST 1 TO AUGUST 2
PORTLAND AREA IN BLUE***

2. AUGUST 2, 2004

This was another “problem” or “episode” lightning event. This event could be interpreted as a continuation of the August 1st episode. However, a cancellation statement was issued at 2056 PDT on the 1st, officially “ending” the event.

The upper ridge continued to break down on the 2nd. The ridge axis had shifted to Eastern Washington and Central Idaho by 12Z on the 2nd. At 00Z on the 3rd the breakdown of the upper ridge over the Pacific Northwest was complete. Heights over Western Oregon had lowered to less than 580 decameters. High temperatures on the 2nd were only in the upper 60s to near 80. Late-morning humidity values were in the middle 40s to near 60. This could not be considered a “dry” lightning pattern, in the classic sense. But, the Dryness Levels remained in the “RED”. ERC values on the 2nd for zone

PORTLAND FIRE WEATHER – 2004 ANNUAL REPORT

608 were still in the 40s to middle 50s. Emigrant reported 59. Fuel indices on the 3rd continued to be in the 40s to around 55. The 100-hour fuel moistures had increased from 7-9 percent at the end of July, to 10-14 on August 3rd. Critical 100-hour fuel moisture values for this area are 9 percent.

A Red Flag Warning was issued at 1327 PDT on the 2nd for zone 608 and was valid until 2100 PDT. A watch was not issued. Lightning occurred from 1500 to 1700 PDT in zone 608 (see figure 8). There were six confirmed fire starts. Rainfall amounts were not that significant. Emigrant RAWS picked up 0.31 inches and Pebble had 0.07 inches.

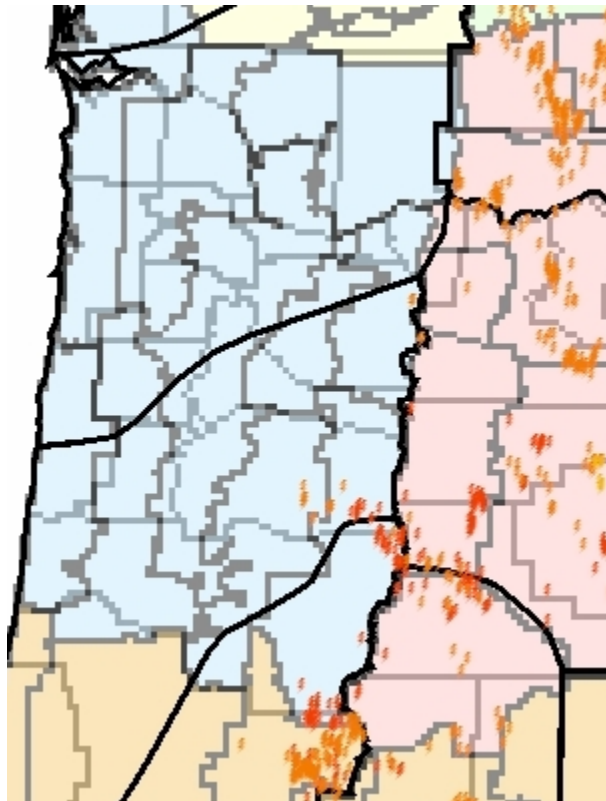


FIGURE 8 – LIGHTNING 0600 TO 0600 AUGUST 2-3, 2004

3. AUGUST 13, 2004

The warmest period of the season took place from about August 7th through the 13th. A strong upper ridge was over the region on the 8th, with 500 mb heights near 590 decameters. High temperatures were in the middle 80s to middle 90s. Emigrant hit 98 degrees and Cannibal (in the Coast Range) climbed to 94 degrees. The 850 mb chart showed a thermal low along the coast and East to Southeast wind at Salem and Hoquiam.

The pattern started to change around the 10th. The upper ridge axis shifted to Central Washington and Oregon, and the low level thermal low was well east of the Cascades. However, the ridge re-amplified on the 11th. The ridge axis remained east of the Cascades, but heights over the west side were in the lower 590s. In addition, a closed upper high was centered over Southwest Nevada. Southwest to West upper level flow

PORTLAND FIRE WEATHER – 2004 ANNUAL REPORT

was over the area. There were some interesting meteorological factors in the 700 mb charts. The 12Z analysis showed a weak closed circulation off the South Oregon Coast. There was south mid-level flow over Western Oregon and a humidity maximum over the south zones. By 00Z, south flow had become established from California all the way to the North Washington coast. Highs in most areas on the 11th were in the middle 80s to middle 90s. ERC values for the Cascade zone on the 11th were in the 50s and 60s. Emigrant reported 70 and Fields had 63. The 100-hour fuel moisture values were the lowest of season, with many areas in the Cascades under 10 percent.

The strong upper ridge persisted on the 12th. There was some backing in the upper level flow, compared to the previous day. At 700 mb, the flow had shifted more to the southeast. Also, the mid-levels had become a little more moist, with a small area of 70 percent humidity over zone 607. High to very high fuel indices persisted in the Cascades, with ERC values mostly in the 50s to middle 60s and 100-hour fuel moisture values in the 6-8 percent range.

A Fire Weather Watch was issued at 1500 on the 12th for zones 607, 608, and 660 and was valid from the afternoon of the 14th through the 16th. The breakdown of the upper ridge started on the 13th. The ridge axis shifted to near the Idaho border and south flow aloft dominated Western Oregon and Washington (see figure 9).

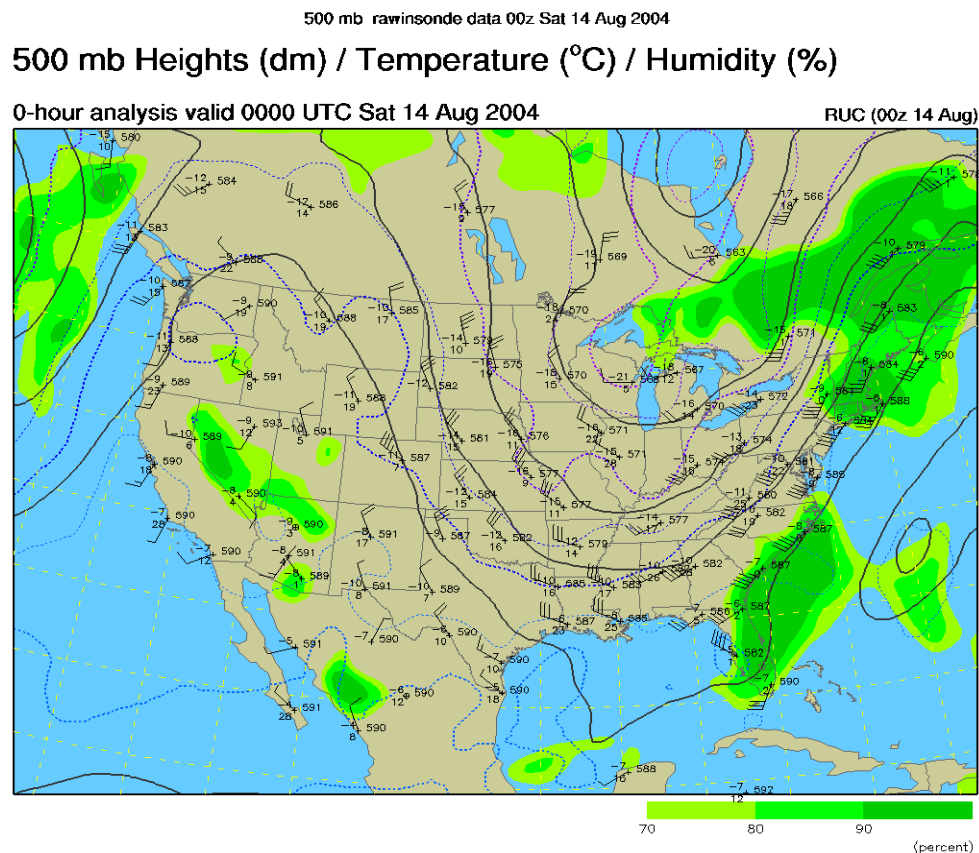


FIGURE 9

PORTLAND FIRE WEATHER – 2004 ANNUAL REPORT

South mid-level flow remained well established over the area. At 856 PDT on the 13th a Red Flag Warning was issued for zone 608 and was valid until 2200 PDT. At 908 PDT the remaining Watch was revised to include zones 605 and 606 (the Cascade foothills) and was in effect for the 14th and 15th.

Thunderstorms developed over Central Oregon around 1700 PDT on the 13th, and drifted over the Crest into zone 608 at 1900 PDT. The main thunderstorm area began over South Central and Southeast Oregon early in the afternoon, but drifted north with the prevailing mid-level flow.

4. AUGUST 14, 2004

This event could have been judged as a continuation of the August 13th episode. Even though an ending statement was not issued for the 13th event, there were significant changes to the August 13th Watch to warrant a new event. The upper ridge continued to breakdown on the 14th, with fairly deep moist south flow over the forecast area. A Red Flag Warning was issued at 635 PDT for zones 605, 606, 607, 608, and 660. However, nocturnal thunderstorms developed as an upper level disturbance moved north from South-Central Oregon with good diffluent upper level flow. Lightning data from 100 to 600 PDT on the 14th showed considerable strikes in the Cascades, north Cascade foothills, and in the Willamette Valley. Lightning occurred later that afternoon in zone 608.

High to very high fuel indices were noted on the 15th, the day after the event. ERC values above 50 were common in zones 606, 607, and 608, with a few areas near 60. Despite the fact that most storms contained precipitation, it was not widespread enough to alleviate the extreme fuel conditions.

ADDITIONAL COMMENTARY ON CRITICAL FIRE WEATHER PATTERNS

Fires burning under a dry and extremely unstable air mass tend to be plume-dominated and can exhibit extreme fire behavior. The Haines Index is a tool used to assess the degree of air mass instability and dryness. In addition, at least **ONE RAWS** must report a minimum humidity of 25 percent or less.

A dry and unstable air mass event is difficult to validate. Upper air soundings in Oregon are taken at Salem and Medford. Obviously, upper air data coverage is rather sparse. The Portland Fire Weather Office uses a model “grid” to produce forecast guidance. The Haines Index is one product of the guidance. Afternoon **FORECAST** Haines Index values are available, but may not be what the “actual” value is for the day.

“Dry” lightning is virtually impossible to evaluate and predict. The general definition of “dry” lightning is lightning with no “significant” accompanying precipitation. Objective criteria to evaluate this phenomenon are difficult to develop due to the localized nature of thunderstorms and the relative scarcity of RAWS stations. The Northwest Coordination Center devised a different approach for “dry” lightning”. Instead of concentrating on whether or not precipitation accompanied thunderstorms, the emphasis was placed on

PORTLAND FIRE WEATHER – 2004 ANNUAL REPORT

fuel conditions. The NWCC developed a Dryness Level product that takes into account ERC and 100-hour fuel moistures. The Portland Fire Weather Office adopted this methodology for “dry” lightning episodes. However, the term “dry” lightning was replaced with “episode” lightning. The term “episode” lightning may have been misunderstood, but the basic concept did not change. The main determining factor for warning issuance and validation was whether the fuel conditions showed a significant change during and after a thunderstorm event.



FAST FACTS: *There were eight days when high temperatures reached or exceeded 95 degrees in zones 605, 607, and 660. The latest day was August 13th. Red Box had a high of 96 and Trout Lake reached 95.*

There were eight days when high temperatures reached or exceeded 95 degrees in zones 606 and 608. The latest day was August 13th. Emigrant recorded a high of 95 degrees. The warmest day was July 23rd. Trout Creek hit 101, Emigrant 99, and Yellowstone 98.

ERC values reached or exceeded 40 in zones 601 and 612 on just three days: July 28th, July 29th, and August 8th.

FIGURE 10- HAWLEY BUTTE RAWS

There were 38 large wildland fires in Region 6 during the 2004 season (as reported via ICS-209). The latest reported wildfire occurred on September 27th. This was the Peter French Fire in Southeast Oregon. The fire was contained on the 28th.

Total suppression costs for the 38 large fires were \$78 million. The Pot Peak fire (Okanogan-Wenatchee N.F.) cost \$27.7 million to fight. The Fischer Fire (Okanogan-Wenatchee N.F.) cost \$9.7 million. The third costliest fire (suppression costs) was the Bland Mtn #2 fire at \$6.6 million.

The 100-hour fuel moisture values in zone 608 dropped to five percent on July 24th, and remained around five percent through the 30th.

The 100-hour fuel moisture values in zones 606 and 608 exceeded 20 percent on August 23rd. The highest value was 36 in zone 608 on August 26th.